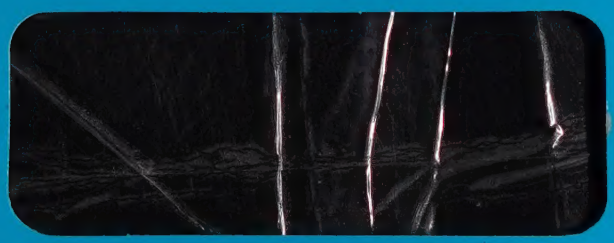
Operating and Service Manual



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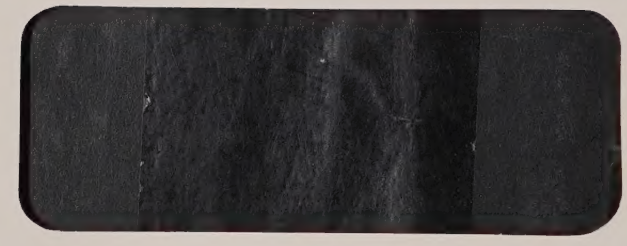

GOULD

MANUAL PART NO
13-804618-00-1

FREQUENCY DEVIATION

CONVERTER

MODEL 13-4618-00

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3631 Perkins Avenue, Cleveland, Ohio 44114

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TORONTO
ALLAN CRAWFORD ASSOC., LTD
6503 Northam Drive
Mississauga, Ontario, Canada
Phone: 678-1500

EUROPE

GOULD ALLCO S.A.
57 rue St. Sauveur 91160
Ballainvilliers, France
Phone: 909-10-67

GOULD ADVANCE
Roebuck Road
Hainault, Essex, England
Phone: 01-500-1000

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SECTION I

GENERAL INFORMATION

1.1 SCOPE

This manual contains specifications, installation and operating instructions for the Gould Frequency Deviation Converter, Model 13-4618-00. In addition a theory of operation, calibration procedures and a parts breakdown is included.

1.2 INTRODUCTION

1.2.1 Description

The Gould Frequency Deviation Converter (Figure 1-1) is a single channel, plug-in signal conditioner. It measures the frequency deviation from a center frequency of 50, 60 or 400 Hz and develops a 0 to ±2.5 volt dc output signal proportional to the deviation. The converter was designed for plug-in operation with Gould 2000 Series direct writing recorders. When so used, it receives operating power directly from the pendrive amplifier of the recorder channel it serves. This reduces converter complexity, eliminates power supply noise pickup, and improves reliability.

This converter is not limited to operation with Gould 2000 Series recorders. When powered from a standard dc power supply that provides ±15 volts of suitable quality, it can be used with any Gould recorder or other readout device with similar input characteristics.

Numerous applications for this signal conditioner include: checking the stability and accuracy of low frequency signal sources in the laboratory; monitoring the speed regulating governors and electronic synchronizing equipment on turbo-generators; and checking the ac systems in emergency or remote power units, aircraft, and on shipboard.

Since it is a continuous monitoring unit with fast response, the Gould Frequency Deviation Converter is especially useful for detecting fluctuations in frequency due to system instability, step changes in load, switching of transmission lines, and synchronizing electric power generators.

Common mode rejection of 120dB for dc voltages and 80dB at 60Hz permits operation in noisy industrial environments.

The customary input voltage selector switch has been eliminated, since the high impedance input circuit will accept any ac voltage from 10 to 500 volts rms continuously, and will safely reject voltage transients of much greater values.

The factory calibrated, dc output is ±2.5 volts full scale into 2 kilohms or greater, on all sensitivity ranges. This output is electrically compatible with any Gould direct writing recorder or other readout device with similar input characteristics.

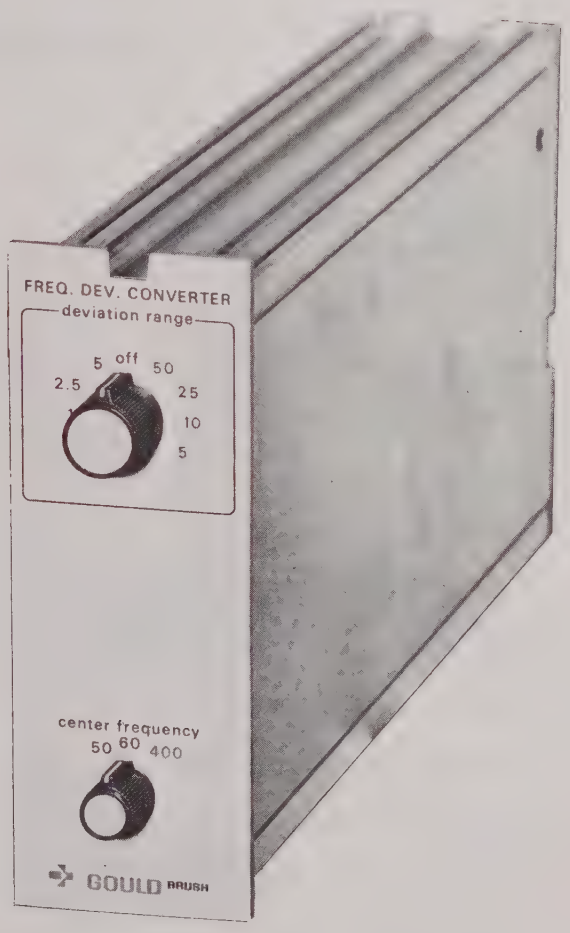


FIGURE 1-1 GOULD MODEL 13-4618-00 FREQUENCY DEVIATION CONVERTER

1.2.2 Important Features of the Frequency Deviation Converter

1. Excellent frequency resolution of up to 1/100 Hz per chart division*.
2. Three center frequencies permit operation at 50, 60 or 400Hz.
3. Accepts any voltage from 10 to 500 volts rms.
4. High voltage isolation of 1,500 volts peak ac or dc from input to ouput.
5. Response time of less than 100 milliseconds.
6. High input impedance of 100,000 ohms.
7. Range Inaccuracy of better than ±0.2%.
8. Deviation Range Switch provides four full scale sensitivity ranges for each center frequency. For center frequencies of 50 or 60Hz, these ranges are ±0.5, ±1, ±2.5, and ±5Hz. For a center frequency of 400 Hz, the full scale sensitivity ranges are ±5, ±10, ±25, and ±50 Hz.

*Operating at 50 or 60Hz and displayed on Gould 100-division graphic chart.

1.3 Specifications

Converter Input

Converter Configuration	Floating Differential 1500V peak ac or dc isolation to chassis.
Impedance	100K ohms ±5% 20 watts.
Input Voltage	10V to 500V rms
Maximum Safe Voltage	1000 volts peak ac or dc
Center Frequencies	50, 60 or 400Hz ±0.025%.

Converter Output

Measurement Ranges	49.5-50.5, 49-51, 47.5-52.5 or 45-55Hz; 59.5-60.5, 59-61, 57.5-62.5 or 55-65Hz; 395-405,390-410, 375-425 or 350-450Hz.
Circuit Configuration	Single ended to common.
Output Voltage	±2.5vdc into 2000 ohms or greater.
Calibration Inaccuracy	±.1% most sensitive range.
Range Switch Inaccuracy	±.2%.
Zero	0 vdc output at center frequency.
Output Impedance	Less than 1 ohm.
Non-Linearity	Within .1% of range.

Instability (After 30 Min. warmup)	ZERO	GAIN
Time	.02% of CF/24 hr.	.02%/24 hr.
Temp	.02% of CF/°C	.08%/°C
Power Supply	.01%/1% Change	

Frequency Bandwidth ..... Less than 3dB DN @ 3 Hz 12 dB/Octave roll off.

Rise Time ..... < 100 ms (10 to 90%).

Overshoot ..... < 0.5%.

Common Mode Rejection ..... >120dB @ dc, 80dB @ 60Hz at 100V input.

Output Noise ..... < 10mv rms most sensitive range.

Environment

Temperature

Storage ..... -40 to 70° C.

Operating ..... 0 to 50° C.

Humidity (Operating) ..... 95% to +35° C (+95° F) non-condensing relative humidity.

Vibration and Shock ..... Best commercial practice.

Physical Characteristics

Dimensions ..... 15.3 cm high x 28 cm long x 5.6 cm wide.

Weight ..... 1.4 Kg (3 lb).

Mounting ..... Retained from rear.

Finish ..... Molded front panel.
Color - Light parchment.

Power Requirements

DC Voltage ..... ±15 volts ±1 volt @ 100ma.

System Specifications when used with Series 2000 Recorders

Gain Accuracy ..... 0.3%.

Non-Linearity ..... 0.45% of full scale range.

Instability	ZERO	GAIN
Time	0.1% CF/24 hrs.	0.1%/24 hrs.
Temp	0.045% CF/° C	0.13%/° C.
Line	0.1% CF/10%	0.5%/10%

Frequency Response ..... See Converter specifications.

Noise ..... < 25mv

Maximum Safe Input Voltage ..... 750V Peak ac or dc.

Common Mode Rejection . . . . . .120dB @ dc, 80dB @ 60Hz at 100V input.

1.4 Supplies and Accessories

Supplied with converter

Input Connector (Male) 11-5407-02

Optional-may be ordered separately

Extender Card and Cable Assembly 887291

Input Connector Adapter. Converts input connector to 3 "binding post" terminals 11-5407-09

Input Connector Adapter. Converts input connector to 6-pin Cannon connector receptacle 11-5407-06

SECTION II

INSTALLATION

2.1 GENERAL

This section describes inspection checks to be made upon receipt of the Gould Frequency Deviation Converter, Model 13-4618-00 with a 2000 Series Recorder. It covers installation procedures, signal input connections, and outline dimensions.

2.2 INITIAL INSPECTION

Prior to attempting any electrical connections or operation visually examine the unit for broken or loose knobs, dented or nicked panels and broken or chipped rear connectors.

2.3 INSTALLATION

Converter Model 13-4618-00 may be mounted in Gould 2000 Recorder frames, or rack mounted separately in a Gould preamplifier enclosure.

2.3.1 Insertion

To install the converter into its appropriate slot:

a. Slide the converter into the enclosure until the rear output card edge connector is engaged.

b. Tighten the rear retaining screw. This locks the converter into the enclosure.

c. Connect the plastic input signal connector and secure it by turning the threaded plastic locking ring clockwise.

2.3.2 Removal

a. Disconnect the input connections with a counterclockwise turn and pull.

b. Loosen the rear retaining screw. The converter will move forward about 1/8 of an inch.

c. Carefully slide the entire converter out of the Gould 2000 enclosure.

2.4 SIGNAL CONNECTIONS

2.4.1 General

Gould converter Model 13-4618-00 has a fully floating, high impedance input circuit of 100K ohms; electrical isolation of 1500 volts from input to output; and the ability to accept any ac waveform from 10 to 500 volts rms.

2.4.2 Input Connection Hardware

NOTE: For signal input connections, use the special connector provided with the converter (Gould part number 11-5407-02).

Connections to the converter are made at the rear. (Figure 2-1). A good signal cable should be used with single pair twisted and shielded.

2.4.3 Output and Power

The amplifier is designed to operate on + and -15 volt, 100ma regulated supplies. Output and power connections are provided through a 16 pin card edge on the rear of the converter (Figure 2-1). The mating connector is located in the recorder chassis.

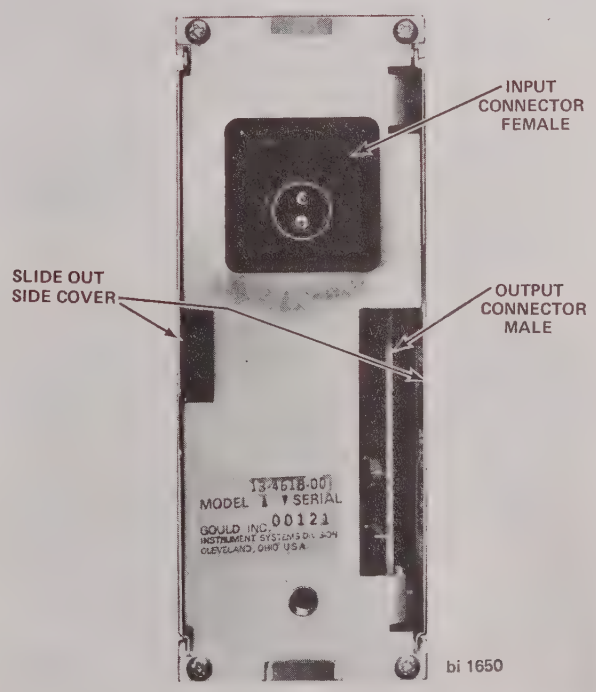


FIGURE 2-1 REAR VIEW

2.5 OUTLINE DIMENSIONS

Refer to Figure 2-2 for outline dimensions.

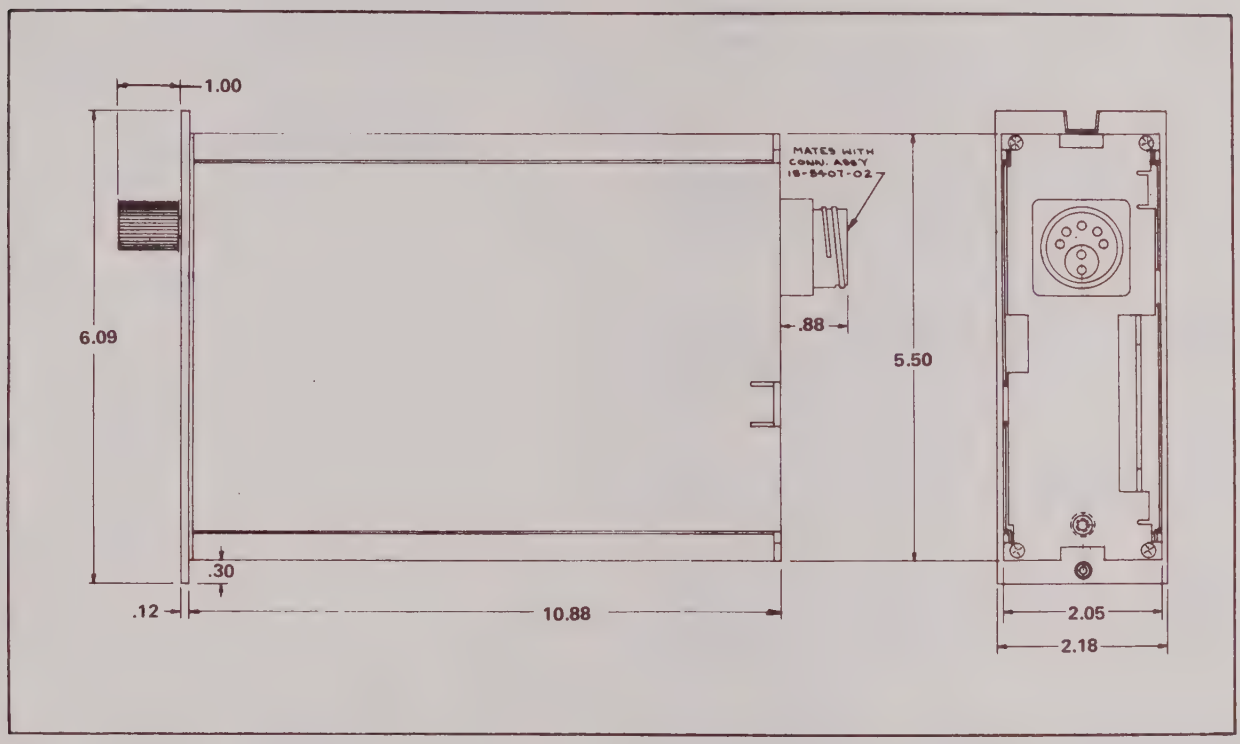


FIGURE 2-2 OUTLINE DIMENSIONS

SECTION III

OPERATION

3.1 GENERAL

This section describes and illustrates the controls of the Frequency Deviation Converter, Model 13-4618-00, and provides operating instructions. Before attempting to apply any signal to the converter it is imperative that the operator completely understand the functioning of the controls and the required input/output specifications.

3.2 FRONT PANEL CONTROLS

There are only two front panel controls. They are as follows:

ITEM	CONTROL	DESCRIPTION
1	Deviation Range Switch (S101)	This is a 9 position rotary selector switch which provides four full scale sensitivity ranges for any of the selected center frequencies. In a clockwise direction, the positions are as follows: The first four positions select deviation ranges of ±0.5 Hz, ±1 Hz, ±2.5 Hz, and ±5 Hz, respectively, These ranges are for use when a center frequency of 50 or 60 Hz is selected. The center position is "off". In this position the converter is not shut off, but the input signal is removed from the circuit. Pen position should be at chart center. The last four positions select deviation ranges of ±50 Hz, ±25 Hz, ±10 Hz, and ±5 Hz, respectively. These ranges are for use when a center frequency of 400 Hz is selected.
2	Center Frequency Switch (S102)	This is a 3 position switch which allows the operator to select either 50 Hz, 60 Hz, or 400 Hz as the input signal frequency.

3.3 INTERNAL CONTROLS

The internal controls are not for operator use. See section IV for calibration instructions, if required.

3.4 APPLYING A SIGNAL TO THE CONVERTER

CAUTION: BEFORE APPLYING A SIGNAL TO THE CONVERTER, VERIFY THAT THE INPUT VOLTAGE DOES NOT EXCEED THE SPECIFIED LIMIT OF 500 VOLTS RMS.

3.4.1 General

This section lists the logical sequence of steps necessary to apply a signal to the converter.

a. Do not plug in modules until instructed.

b. Set DEVIATION RANGE switch to OFF.

c. Set CENTER FREQUENCY switch to the proper setting for the input signal frequency range.

d. Verify all recorder controls and settings, switch recorder main power "ON", and allow sufficient warm-up time.

e. Plug converter into rack and complete all input signal connections at the rear panel. See section II, Installation.

f. Select a slow chart speed.

g. Set PEN POSITION control so pen tracks in chart center.

h. Apply the input signal. Voltage must be 10 to 500 volts rms and be symmetrical about zero with zero crossover.

j. Set the DEVIATION RANGE switch to one of the positions designated for the input signal frequency (black for 50 or 60Hz, blue for 400Hz) and having the desired full scale sensitivity.

3.5 FUNCTIONAL TEST PROCEDURE

This procedure should be performed to verify operation and calibration of this unit. If the output is within the tolerance given, no calibration is required. If not, refer to Section IV of this manual.

a. Install preamplifier in carrying case or rack and connect AC signal source to input. Set input to 0 volts. Allow 30 minute warm-up time.

b. Turn CENTER FREQUENCY to 60 and RANGE to 0.5. Apply a 60Hz ±.001Hz signal to input. Output should be 0V ±100mv.

c. Change input to 59Hz ± .001Hz. Output should be -5V ±2.5mv.

d. Turn CENTER FREQUENCY off. Remove input signal. Unit is ready for use.

3.6 THEORY OF OPERATION

3.6.1 General

The Gould Frequency Deviation Converter Model 13-4618-00, is a single channel, plug in signal conditioner designed to be compatible with the 2000 Series Recorder Line. It measures the frequency deviation from a center frequency and outputs a 0 ±2.5 volt dc signal proportional to the deviation.

The center frequency switch on the front panel sets the center frequency to 50, 60 or 400Hz. The deviation range switch sets the outputs sensitivity to ±.5 to ±5 Hz for 50, 60 Hz operation or ±5 to ±50 Hz for 400Hz operation.

3.6.2 Input Circuit

The unit is designed to normally monitor power line frequencies and is independent of input voltage within a 10 to 500 volt rms range. The 10 volt rms level facilitates calibration of the unit but at this level the signal must be symmetrical about a 0 dc level. Figure 6.3 shows the schematic of the unit.

The input signal is applied to the active attenuator network R101, 102 and CR101, 102 to limit the ±.7 volt peak. The output voltage of T101 is shaped by the 741 comparator, U101, to be compatible with the T^2 L levels required by the 7400, U102. U102 constitutes two schmitt trigger circuits to obtain the fast rise and fall characteristics on the command and feed back frequencies required by the phase detector U104. U103 is used to count down the 400Hz input to a 50Hz signal.

3.6.3 Phase-Locked Loop

The operation of the frequency deviation converter is based on servo theory and is commonly referred to as a phased lock loop (PLL). A simplified block diagram of the PLL is shown in Figure 3-1.

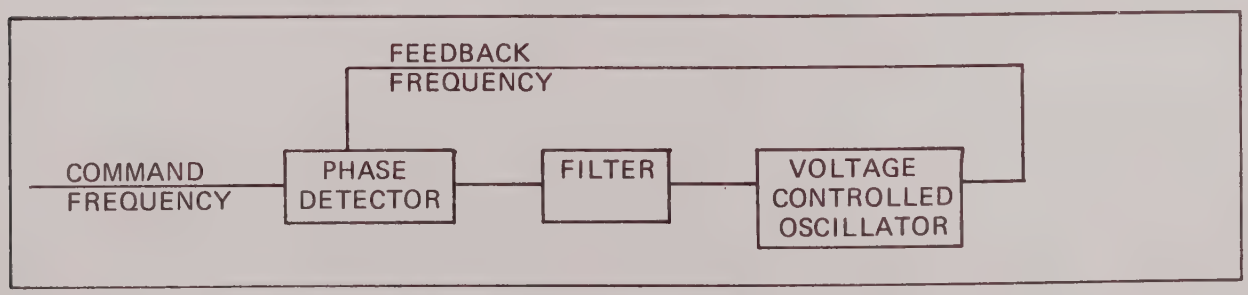


FIGURE 3-1 BLOCK DIAGRAM—PHASE-LOCKED LOOP

The phase detector compares the command and feed back frequencies and produces a pulse output whose duration and polarity is proportional to the phase difference between them. This signal is filtered and applied to the voltage controlled oscillator which converts the dc level to the feed back frequency. When the feed back frequency is equal to the command frequency and thier phase difference is zero, the pulse duration goes to zero and the output of the filter is held at the required voltage to produce the feed back frequency. U-105-1, U105-2 and U106-2 constitute the filter section of the block diagram. Symmetry, damping, noise and span controls are associated with the filter section to provide the necessary adjustments. The 50 and 60Hz center frequency adjustment is connected through R140 to U106. U105-3, U106-1 and 4 and the 4 transistors of U107 comprise the linear voltage controlled oscillator. U106-3 provides a zero crossover detector to produce the required feed back frequency.

3.6.4 Output Circuit

U105-4 and its associated circuitry provide the necessary gain changes for the deviation ranges.

SECTION IV

CALIBRATION

4.1 GENERAL

In addition to detailed calibration procedures, this section contains paragraphs on troubleshooting and maintenance.

NOTE: This procedure is broken down into steps by individual adjustments. Under normal conditions, complete calibration should be performed every six months. After repair of the unit or some other change in the electronics, it is necessary only to recalibrate those circuits affected by the change.

4.2 CALIBRATION

4.2.1 General

The Gould Frequency Deviation Converter, Model 13.4618-00, has been accurately calibrated before shipment from the factory and should give long trouble free service. Should recalibration be required, it should be performed by qualified technical personnel only.

CAUTION: CALIBRATION SHOULD NOT BE ATTEMPTED UNLESS SUITABLE, SPECIFIED TEST EQUIPMENT IS USED. SINCE SPECIAL, HIGH PRECISION EQUIPMENT IS REQUIRED, IT IS RECOMMENDED THAT THIS MODEL BE RETURNED TO THE FACTORY FOR RECALIBRATION.

NOTE: Performance checks in this section specify limitations based on optimum "new-equipment" values. Should any results be unacceptable, please see the troubleshooting section of this manual or your Gould Service Representative.

4.2.2 Test Equipment Required

The following is a list of test equipment necessary for calibration.

1. Extender card and cable assembly, Gould P/N 887291.
2. Digital Voltmeter: 4½ digit, 0.05% accuracy.
3. AC Source: Wavetek 110 or equal.
4. Frequency Counter — Gould Model TC17A or equal.
5. Oscilloscope: Gould Model OS3300B or equal.
6. 2000 series recorder.

4.2.3 Preliminary Procedure

a. Remove right side cover from preamp (Figure 4-1).

b. Attach signal input cable to frequency source, and card edge connector to power supply and Digital Voltmeter. Plus and minus power supply go to pins 4 and 3, respectively. Pins 1 and 5 are connected on the board, they are signal common and ground. Pin 2 is the dc output.

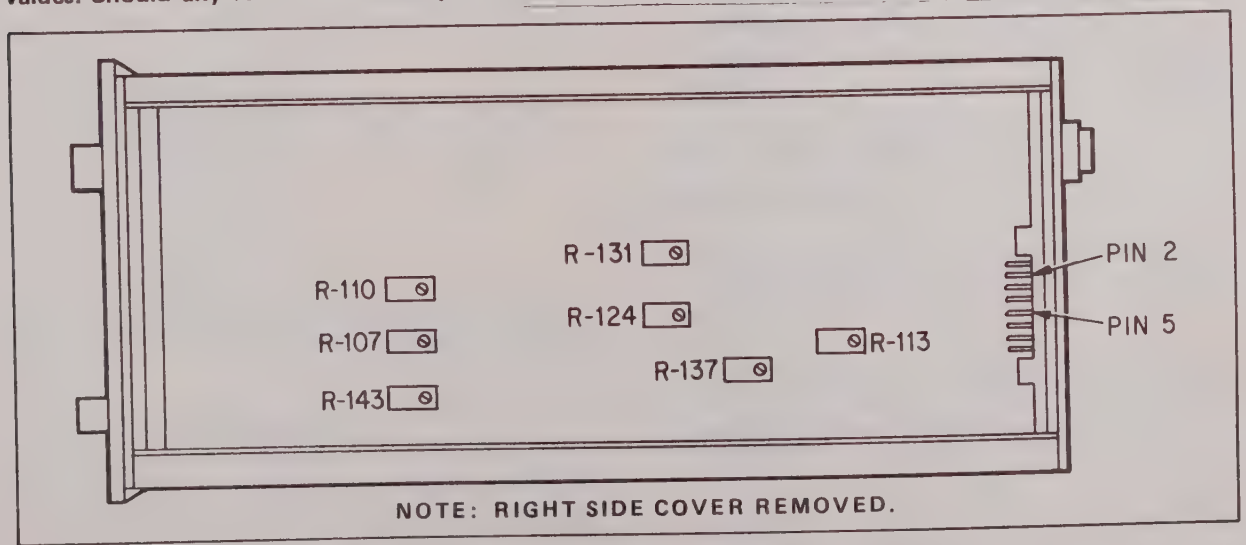


FIGURE 4-1 CALIBRATION COMPONENT LOCATION

c. Apply Power: ±15vdc ±1 volt @ 100ma supply or power from a series 2000 recorder. Allow 30 minutes warmup.

4.2.4 Output Zero Control Adjustment

a. Set converter front panel controls as listed below.

CONTROL	POSITION
RANGE Switch	OFF
FREQUENCY Switch	60Hz

b. Using the digital voltmeter adjust the preamp zero control (R113) for an output of 0 ±.005 volts D.C.

4.2.5 60Hz Control Adjustment

a. Set the RANGE switch to the 5Hz position and apply a 55Hz frequency to the preamp input.

b. Adjust the 60Hz control, R107, to obtain a -2.5 ±.01 volt output on the digital voltmeter.

4.2.6 Span Control Adjustment

a. Change the input frequency to 65Hz and adjust the span control, R143, to obtain a ±2.5 ±.01 volt output on the digital voltmeter.

b. Change the input frequency back to 55Hz and readjust the 60Hz control for a -2.5 ±.01 volt output.

c. Repeat 4.2.6a to eliminate interaction.

4.2.7 Symmetry Control Adjustment

Change the input frequency from 55 to 65Hz at a repetition rate of .1Hz. Using the scope, adjust the symmetry control, R124, for equal rise and fall times at the output within 3 ms of each other.

4.2.8 Damping Control Adjustment

With the same frequency deviation as in 4.2.7, adjust the damping control, R137, to obtain a 95ms rise time at the output as displayed on the scope.

4.2.9 Noise Control Adjustment

a. Set the input frequency to 60Hz and connect the output to a recorder. Set the RANGE switch to the 5Hz position and turn the noise control, R131, fully clockwise.

b. Connect a scope from TP3 (GND) to the right end of the filter capacitor, C101. Set the scope to the 5MV/DIV. A.C. range.

c. Turn the noise control clockwise to reduce the noise level on the scope to a minimum.

4.2.10 Span Control Readjustment

a. Set the input frequency to 55Hz and read the output on a digital voltmeter to within ±.005 volts.

b. Readjust the span control, R143, to obtain an output that is +5 ±.005 volts with respect to the reading at 55Hz. (CW increases span.)

4.2.11 60Hz Control Readjustment

Readjust the 60Hz control, R107, to obtain 0 ±.01 volts at the output on the .5Hz range with 60Hz input.

4.2.12 50Hz Control

a. Turn the CENTER FREQUENCY switch to the 50Hz position and change the input frequency to 50Hz.

b. Adjust the 50Hz control, R110, to obtain a 0 ±.01 volt output.

c. Turn the CENTER FREQUENCY switch to 400Hz and the RANGE switch to the blue 5 cycle position. The output should be 0 ±.015 volts with an input frequency of 400Hz.

4.3 SYSTEM CALIBRATION CHECK

4.3.1 Zero and Span

a. Turn the RANGE switch to OFF and determine that the output is 0 ±10mv with a digital voltmeter.

b. Connect a 10 volt rms 60 ±.001 Hz signal to the input. Turn the CENTER FREQUENCY switch to 60 and the RANGE switch to the .5 position.

c. The output voltage should be 0V ±100mv.

4.3.2 Range Switch

a. Turn the CENTER FREQUENCY switch to 60Hz and the RANGE to .5. Apply a 59 & 60±.001Hz signal to the input. The difference in output read on a digital voltmeter should be 5.0 ± .025 volts.

b. Rotate the RANGE switch clockwise to the next position and repeat step a, above. The output should read as follows:

RANGE POSITION	OUTPUT	
1.0	-2.5	±12.5mv
2.5	-1	±5mv
5.0	- .5	±2.5mv

c. Repeat b, above using 390Hz with a center frequency of 400Hz.

RANGE POSITION	OUTPUT	
5	-5	±30mv
10	-2.5	±15mv
25	-1	±7.5mv
50	- .5	±3mv

4.3.3 Noise

Turn the RANGE switch to the .5Hz position and the CENTER FREQUENCY switch to 60Hz. Apply 60 ±.001Hz to the input. Monitor the output with a recorder or a scope. The noise level should be less than 10 mv rms.

4.3.4 Step Response

Turn the RANGE switch to the black 5Hz position and the CENTER FREQUENCY to 60Hz. Apply a step change in frequency to the input at a repetition rate of .1Hz and a deviation of 55 to 65Hz. Measure the rise and fall times at the output with a scope. The rise and fall times of the step response should be less than 100ms.

4.3.5 Input Voltage Amplitude

a. Apply a variable amplitude 60 ±.001Hz signal to the input. Set the RANGE switch to .5Hz and the CENTER FREQUENCY switch to 60Hz.

b. Vary the input amplitude from 10 volts rms to 500 volts rms. The output should be independent of the input voltage amplitude.

4.3.6 Common Mode Rejection

a. Apply a 10 volts rms 50Hz signal with a common mode voltage of 50 volts rms @ 60Hz to the input. Set the RANGE switch to .5Hz and the CENTER FREQUENCY to 50Hz.

b. The output on a recorder or a scope should be 0 volt dc with less than 50mv of ripple for a 60Db CMR.

4.4 TROUBLESHOOTING

Troubleshooting may be performed in conjunction with the schematic (located after the parts section) and the bench equipment listed in paragraph 4.2.2. When the converter is used with a Gould 2000 Series Recorder, refer to the troubleshooting table in Section V of the recorder manual.

4.5 MAINTENANCE

4.5.1 General

Maintenance on the converter is limited to cleaning only.

CAUTION

a. BEFORE ATTEMPTING TO CLEAN CONVERTER, TURN OFF POWER AND REMOVE FROM ENCLOSURE.

b. AVOID USE OF CHEMICAL CLEANING AGENTS WHICH MIGHT DAMAGE PLASTIC OR PRINTED SURFACES. DO NOT USE CHEMICALS WHICH CONTAIN TOLUENE, CELLUSOLVE, ACETONE OR SIMILAR SOLVENTS.

4.5.2 Exterior

Remove loose dust with a soft cloth or small paint brush. Dirt which remains can be removed with a soft cloth dampened in mild detergent and water solution. DO NOT USE ABRASIVE CLEANERS.

4.5.3 Interior

Dust in the interior should be removed occasionally due to its electrical conductivity under high humidity conditions. Blow off accumulated dust with dry low pressure air. Remove any dirt which remains with a soft paint brush or a soft cloth dampened in a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces and/or printed circuit boards.

SECTION V

PARTS IDENTIFICATION

5.1 GENERAL

This instrument has been accurately calibrated and adjusted before shipment from the factory and should give long, trouble-free service. For servicing beyond the scope of the instructions contained in this manual or the technical equipment available, contact your nearest Gould Service Engineer listed on the warranty card shipped with the instrument.

The following parts lists and schematic diagrams are designed to assist in servicing and repairing the instrument.

NOTE: Check to be sure the schematic number and revision letter stamped on the rear of the instrument agree with the number and revision letter on the schematic contained in this section.

To assure prompt and satisfactory delivery of replacement parts, include the following with the purchase order:

1. Name, model number, and serial number of the instrument.

   For Example: Frequency Deviation Converter Model 13-4618-00 Serial Number_____

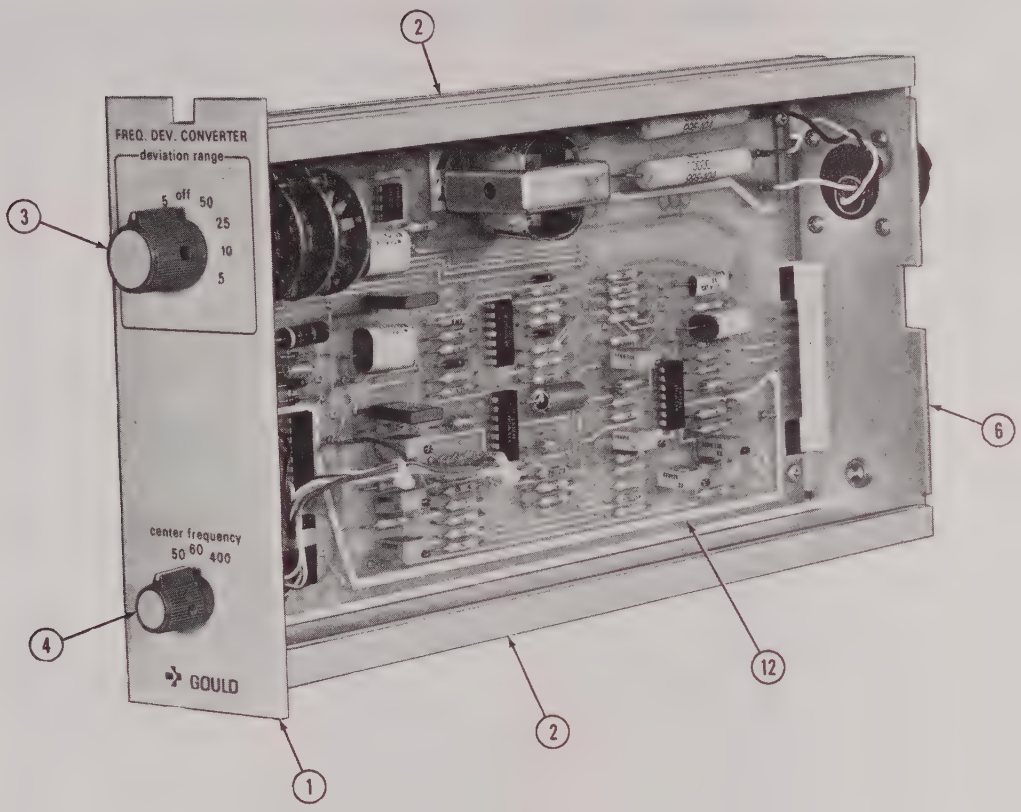
2. Description of the part as listed in the manual.

3. Gould part number.

NOTE: Do not use the SYMBOL NUMBER from the parts list for identifying desired parts on the order.

GOULD FREQUENCY DEVIATION CONVERTER
MODEL 13-4618-00
FIGURE 5-1

ITEM NO	PART NUMBER	DESCRIPTION	SYMBOL NO
1	787528	Panel Assembly, Silkscreen	
2	685944-1	Frame	
3	285652-2	Knob	
4	285652-1	Knob	
5	787880	Switch Assembly, Rotary	S102
6	785946	Panel Assembly, Rear	
7	687874	Connector Assembly	J101
8	387509	Panel, Sub	
9	686421	Cover Assembly, Left Side	
10	285943	Cover, Right Side (Not Shown)	
11	247523-124	Plate, Identification	
12	887886	Board Assembly (See Fig. 5-2)	
13	11-5407-02	Connector, Male (Not Shown, Mates with J101)	P101



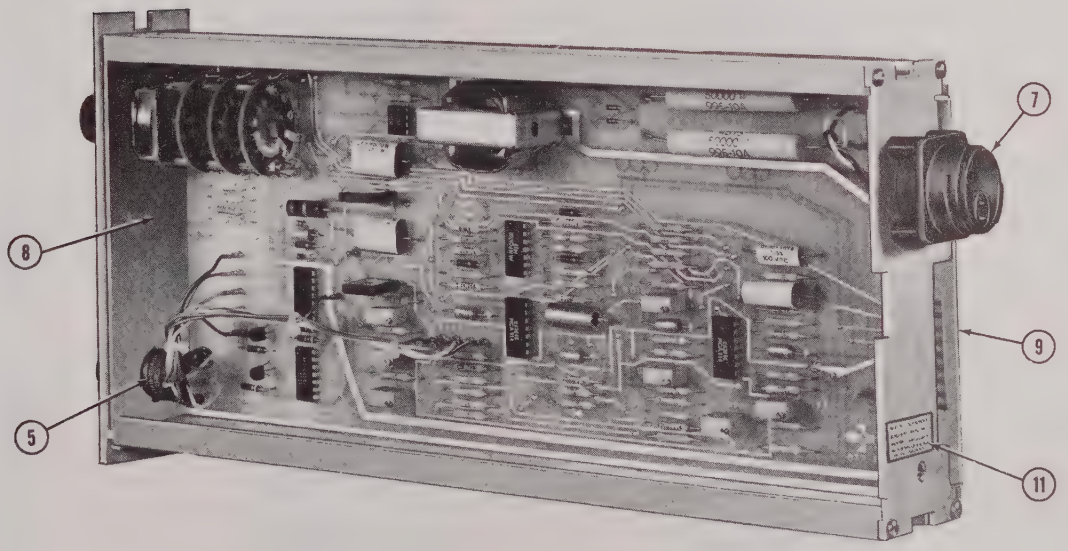


FIGURE 5-1 FREQUENCY DEVIATION CONVERTER

GOULD FREQUENCY DEVIATION CONVERTER, MODEL 13-4618-00
ELECTRICAL PARTS LIST
AMPLIFIER BOARD ASSEMBLY (887886)
FIGURE 5-2

SYMBOL NO	PART NUMBER	DESCRIPTION
C101	5-241145-104	Capacitor
C102	5-241145-504	Capacitor
C103	5-287730-474	Capacitor
C104	10-241145-504	Capacitor
C105, C106	262585-106	Capacitor
C107	10-241145-504	Capacitor
C108 thru C110	262585-106	Capacitor
CR101, CR102	280440	Diode
CR103, CR104	241133	Diode
CR105	269256-7	Diode
CR106	241133	Diode
CR107, CR108	280440	Diode
R101, R102	5-118180-503	Resistor
R103, R104	5-241111-103	Resistor
R105	5-241111-105	Resistor
R106	25-284694-10001	Resistor
R107	269085-102	Resistor, Variable
R108	25-284694-100R0	Resistor
R109	25-284694-10001	Resistor
R110	269085-102	Resistor, Variable
R111	25-284694-100R0	Resistor
R112	25-284694-15000	Resistor
R113	269085-103	Resistor, Variable
R114	25-284694-10002	Resistor
R115, R116	25-284694-50001	Resistor
R117	25-284694-40001	Resistor
R118	25-284694-10001	Resistor
R119	5-241111-472	Resistor
R120, R121	5-241111-103	Resistor
R122	5-241111-472	Resistor
R123	25-284694-10001	Resistor
R124	269085-502	Resistor, Variable
R125	25-284694-20000	Resistor
R126	25-284694-10001	Resistor
R127	25-284694-20001	Resistor
R128	25-284694-18001	Resistor
R129	25-284694-20000	Resistor
R130	25-284694-10003	Resistor

GOULD FREQUENCY DEVIATION CONVERTER, MODEL 13-4618-00
ELECTRICAL PARTS LIST
AMPLIFIER BOARD ASSEMBLY (887886)
FIGURE 5-2 (Continued)

SYMBOL NO	PART NUMBER	DESCRIPTION
R131	269085-103	Resistor, Variable
R132, R133	25-284694-20001	Resistor
R134	25-284694-40000	Resistor
R135, R136	25-284694-20001	Resistor
R137	269085-202	Resistor, Variable
R138	25-284694-20000	Resistor
R139, R140	25-284694-10001	Resistor
R141	25-284694-50001	Resistor
R142	25-284694-50000	Resistor
R143	269085-202	Resistor, Variable
R144	25-284694-20000	Resistor
R145	25-284694-10000	Resistor
R146	25-284694-15001	Resistor
R147	25-284694-10001	Resistor
R148	25-284694-50000	Resistor
R149	25-284694-10001	Resistor
R150	5-241111-472	Resistor
R151	25-284694-10001	Resistor
R152	25-284694-50000	Resistor
R153	25-284694-10001	Resistor
R154, R155	25-284694-20000	Resistor
R156, R157	25-284694-60000	Resistor
R158	25-284694-20000	Resistor
R159, R160	5-241111-202	Resistor
R161	25-284694-20000	Resistor
R162, R163	25-284694-10001	Resistor
R164	R1-284694-10000	Resistor
R165	R1-284694-613R7	Resistor
R166	R1-284694-203R9	Resistor
R167	R1-284694-202R8	Resistor
R168	5-115558-620	Resistor
R169	5-241111-472	Resistor
S101	287523	Switch
T101	287736	Transformer
U101	286020	Integrated Circuit
U102	281103	Integrated Circuit
U103	270622	Integrated Circuit
U104	287901	Integrated Circuit
U105, U106	287740	Integrated Circuit
U107	287602	Transistor
U108	287496	Voltage Regulator
U109	287498	Voltage Regulator

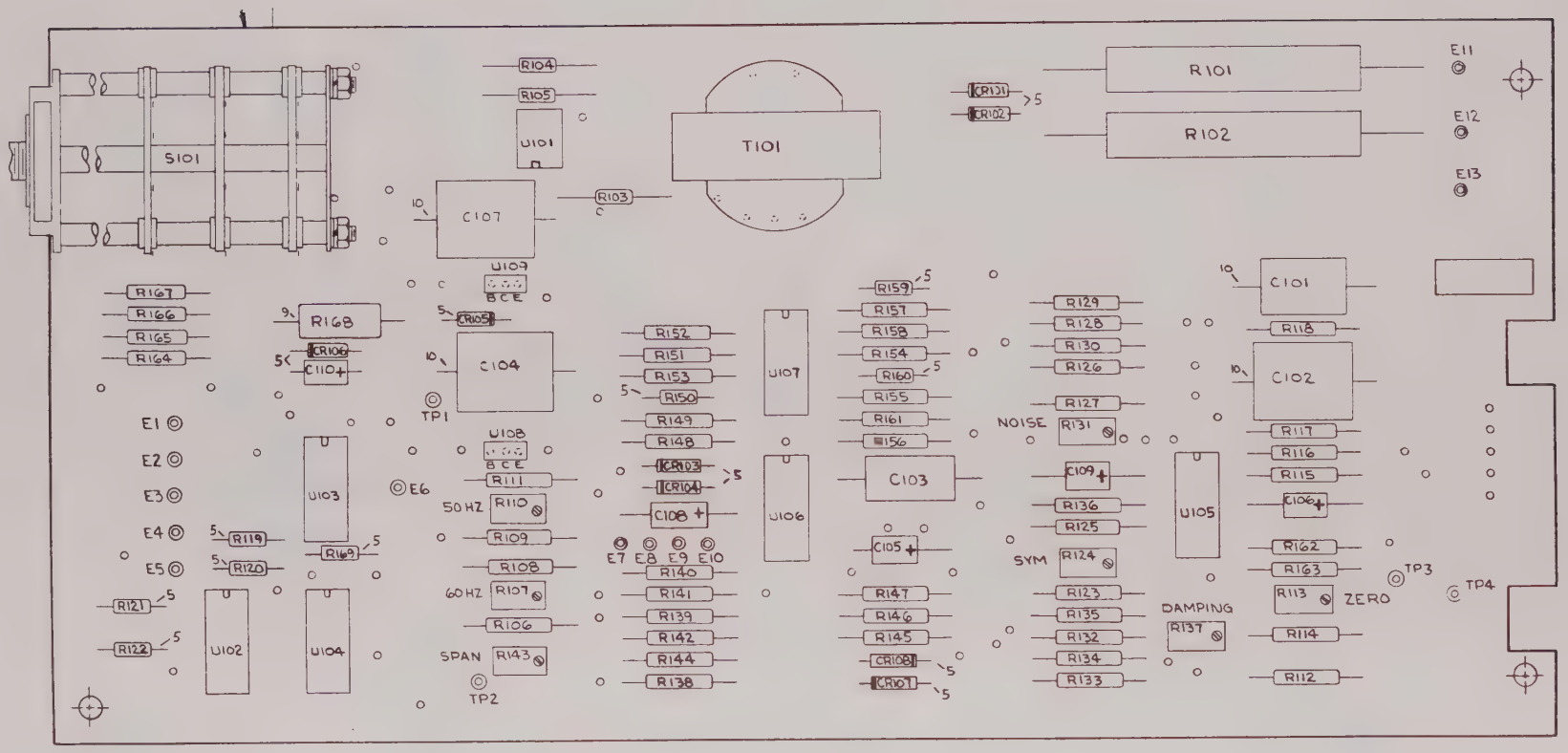
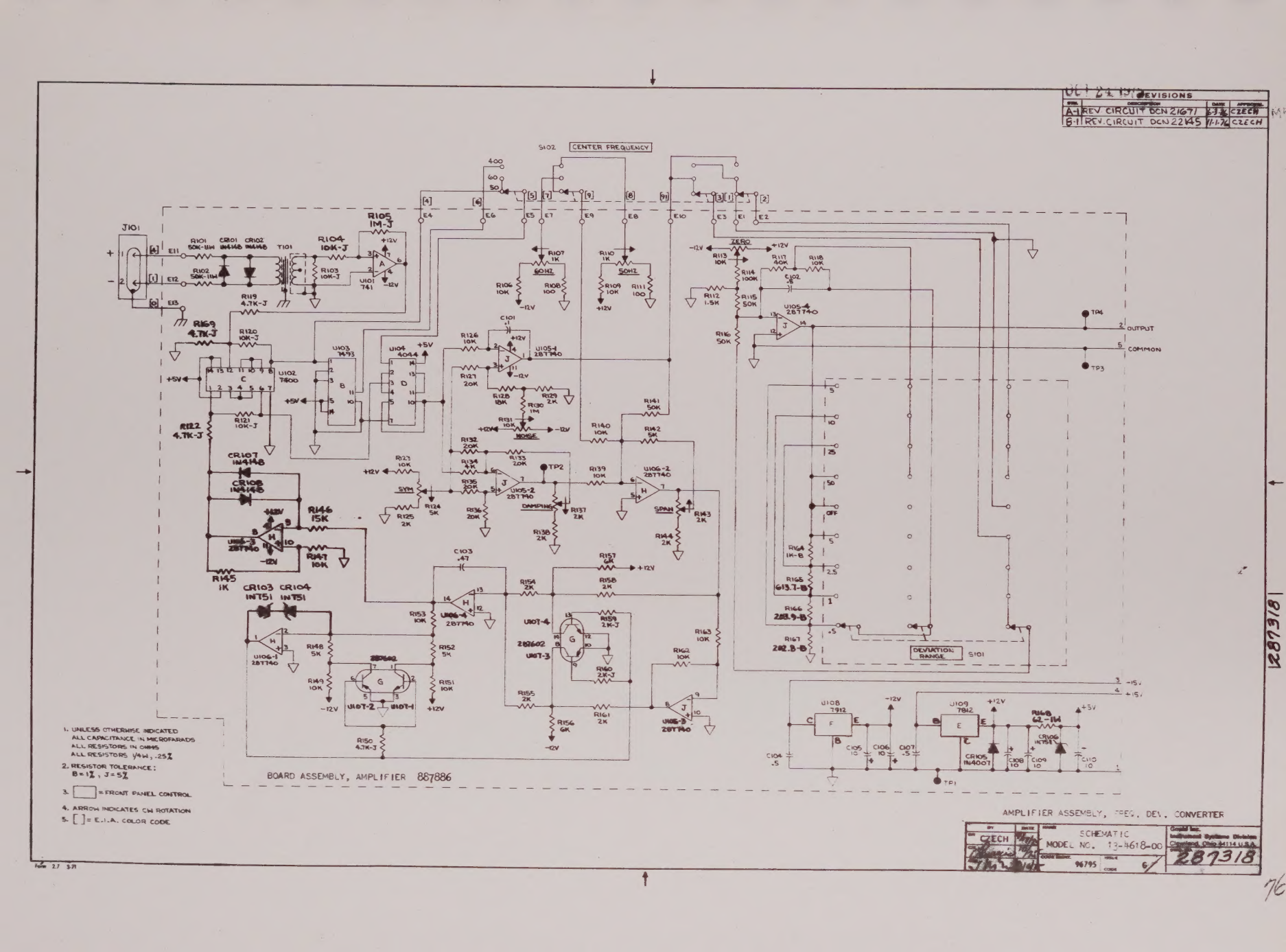


FIGURE 5-2 BOARD ASSEMBLY 887886


REVISIONS
A-1 REV. CIRCUIT DCN 21671 CZECH
B-1 REV. CIRCUIT DCN 22145 CZECH
S102 CENTER FREQUENCY
400
60
50
JI01
R101 50K-1W
R102 50K-1W
CR01 1N4148
CR02 1N4148
T101
R103 10K-J
R104 10K-J
R105 1M-J
U101 741
R119 4.7K-J
R109 4.7K-J
R120 10K-J
R121 10K-J
R112 4.7K-J
U102 7400
U103 1493
U104 4044
CR107 1N4148
CR108 1N4148
R146 15K
R147 10K
R145 1K
CR103 INT51
CR104 INT51
U106-1 2BT740
U106-3 2BT740
U106-4 2BT740
U106-2 2BT740
U105-1 2BT740
U105-2 2BT740
U105-3 2BT740
U105-4 2BT740
U107-1
U107-2
U107-3
U107-4
2BT602
R107 1K
R108 100
R106 10K
R110 1K
R109 10K
R111 100
50HZ
60HZ
R126 10K
R127 20K
R128 18K
R129 2K
R130 1M
R131 10K
NOISE
R132 20K
R133 20K
R134 4K
R135 25K
R136 20K
R137 2K
R138 2K
R139 10K
R140 10K
R141 50K
R142 5K
R143 2K
R144 2K
SYM
DAMPING
SPAN
R123 10K
R124 5K
R125 2K
TP2
C101 .1
C102 .5
C103 .47
R148 5K
R149 10K
R150 4.7K-J
R151 10K
R152 5K
R153 10K
R154 2K
R155 2K
R156 6K
R157 6K
R158 2K
R159 2.1K-J
R160 2K-J
R161 2K
R162 10K
R163 10K
ZERO
R113 10K
R114 100K
R115 50K
R112 1.5K
R117 40K
R118 10K
R116 50K
TP4
OUTPUT
COMMON
TP3
R164 1K-B
R165 613.7-B
R166 283.9-B
R167 282.8-B
DEVIATION RANGE
S101
OFF
U108 7912
U109 7812
C104 .5
C105 10
C106 10
C107 .5
C108 10
C109 10
C110 10
CR105 IN4001
CR106 IN751
R168 62-1W
TP1
-15V
+15V
1. UNLESS OTHERWISE INDICATED ALL CAPACITANCE IN MICROFARADS ALL RESISTORS IN OHMS ALL RESISTORS 1/4W, ±2%
2. RESISTOR TOLERANCE: B = 1%, J = 5%
3. [ ] = FRONT PANEL CONTROL
4. ARROW INDICATES CW ROTATION
5. [ ] = E.I.A. COLOR CODE
BOARD ASSEMBLY, AMPLIFIER 887886
AMPLIFIER ASSEMBLY, FREQ. DEV. CONVERTER
SCHEMATIC
MODEL NO. 13-4618-00
96795
287318
287318

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Gould Inc., Instruments Division
3631 Perkins Avenue, Cleveland, Ohio 44114
Telephone (216) 361-3315

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